

(19)

Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

**EP 0 335 638 B1**

(12)

## EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention  
of the grant of the patent:  
**18.09.1996 Bulletin 1996/38**

(51) Int Cl.<sup>6</sup> **G06F 17/60**

(21) Application number: **89303007.2**

(22) Date of filing: **28.03.1989**

(54) **System for facilitating coordination of activities by a plurality of actors**

System zur Vereinfachung der Tätigkeitkoordination bei mehreren Tätern

Système pour faciliter la coordination d'activités entre une pluralité d'acteurs

(84) Designated Contracting States:  
**DE FR GB NL**

(30) Priority: **28.03.1988 US 173768**

(43) Date of publication of application:  
**04.10.1989 Bulletin 1989/40**

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- **ACM TRANSACTIONS ON OFFICE INFORMATION SYSTEMS** vol. 2, no. 4, October 1984, KWETNIET pages 303 - 330; M. MAZER & F. LOCHOVSKY: 'Logical Routing Specification in Office Information Systems'
- **ACM TRANSACTIONS ON OFFICE INFORMATION SYSTEMS** vol. 4, no. 3, July 1986, pages 185 - 204; C. WOO & F. LOCHOVSKY: 'Supporting Distributed Office Problem Solving in Organisation'
- **IBM SYSTEMS JOURNAL** vol. 21, no. 3, 1982, ARMONK, NEW YORK US pages 327 - 350; V. LUM ET AL: 'OPAS; An office procedure automation system'
- **PROCEEDINGS OF THE 4TH INTERNATIONAL WORKSHOP ON SOFTWARE SPECIFICATION AND DESIGN** April 1987, pages 242 - 248; D. MARCA ET AL.: 'A Specification Method for Coordinated Work'

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## Description

**BACKGROUND OF THE INVENTION****1. Field of the Invention**

The invention relates to digital data processing systems and more particularly provides a computer system that facilitates coordination of activities of a plurality of actors in connection with a common operation.

**2. Description of the Prior Art**

As the costs of digital data processing systems, that is, computers, decrease, they are being used more widely in the workplace. For some time, computers have been used to provide critical personnel, bookkeeping, accounting and inventory services for companies. More recently, computers have been used to provide assistance in a number of other office activities, most notably word processing and communications, and computer-aided design, engineering and manufacturing.

Many of the areas in which computers provide office support have been those in which the activities are largely individual or in which all actors in the activity have a common goal presumed unaffected by outside activities which may be competing for resources and the like. For example, in word processing, typically only one person works on a particular document, or portion of a document at a time, and thus word processing is largely an individual activity. In addition, in computer-aided design, engineering and manufacturing, even if more than one person is involved in the activity, the activity tends towards a common goal, that is, designing and manufacturing a product. However, many activities in the workplace are not isolated, that is, they require coordination of a number of actors and competition for limited resources, financial and otherwise, that are available within a company.

Prior art reference *"ACM Transactions on Office Information Systems,"* Volume 2, No. 4, October 1984, pages 303 - 330, describes a message management system for the automating of message routing. For any given message, the routing is either specifically specified at the time of message creation, or is implied by the type of message. Once the routing is established, the message is sent according to the prescribed route. Only one activity, namely messaging, is disclosed, and no constituent activities of messaging are disclosed. Since there are no constituents, there are no objects "each associated with a constituent" disclosed, as taught in this reference. Actions performed are performed on messages, not objects, as the term is used in the specification.

Prior art reference *"ACM Transactions on Office Information Systems,"* Volume 4, No. 3, July 1986, pages 185 - 204, discloses a model for office problem-solving. This prior art reference defines four (4) types of "objects,

" namely data objects (that store information); task objects (model for office procedures); task monitor objects (logical workstations, which are defined as independent, yet cooperating knowledge bases); and agent objects (a representative sent by a task monitor object to communicate with an object located in another task monitor object). A task monitor object supervises the activity of task objects and agent objects. The task objects may access data objects and may pass control to another task monitor.

However, this prior art reference does not disclose the "actor role definition means for storing and defining a plurality of roles that the actor may assume with respect to the constituents" as taught by the present invention.

Prior art reference *"IBM Systems Journal,"* Volume 21, No. 3, 1982, pages 327 - 350, describes an office procedure automation system for the generation and processing of office forms. In this reference, there is no method disclosed for identifying who a particular actor is, or what role the actor may assume relative to any of the activities involved in processing the form.

**SUMMARY OF THE INVENTION**

The invention provides a new and improved system, used in conjunction with a computer, for coordinating activities by a plurality of actors within a common enterprise. The invention in its broad form resides in a system for coordinating actions by a plurality of actors, as recited in claim 1, and in a method performed in a data processing system for coordinating actions by a plurality of actors, as recited in claim 2.

In brief summary, the new activity coordination system coordinates actions in connection with the various constituents of an activity by a plurality of actors. The system includes a plurality of objects each associated with a constituent, with each object including state information defining a state and constituent information containing information relating to said constituent. The system further includes an action definition table identifying processing actions in connection with the various states of each object, a state transition definition table for defining state transitions for each object in connection with each action defined by said action definition table, and an object access definition table identifying actors associated with each constituent. The system initially determines, in response to constituent information from an actor and the object access definition table, the association of the actor with respect to a constituent and selectively processes the object associated with the constituent as defined by said action definition table and modifies the state of the object as defined by said state transition definition table.

The activity coordination system, by use of the objects and tables, formalizes the various constituents of an activity, the actors in those constituents and also the actions which may be taken in connection with each of

the constituents at any given time.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

This invention is pointed out with particularity in the appended claims. The above and further advantages of this invention may be better understood by referring to the following description taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a general functional diagram depicting an activity coordination system constructed in accordance with the invention;

Figs. 2A through 2D and 3 depict details of data structures shown in Fig. 1; and

Figs. 4A and 4B depict a flow diagram illustrating the operations of the system depicted in Fig. 1.

### **DETAILED DESCRIPTION OF AN ILLUSTRATIVE EMBODIMENT**

Fig. 1 is a general functional diagram depicting an activity coordination system 10 constructed in accordance with the invention. In one embodiment, the activity coordination system 10 generally comprises a suitably programmed digital computer system. With reference to Fig. 1, the activity coordination system 10 includes an actor interface 11 through which an operator, or actor, using the activity coordination system 10 provides information and receives responses, a processing module 12 that processes the information received from the actor interface 11 and provides responses, in the form of processed information, to the actor interface 11, and a storage module 13 that stores information that the processing module uses in its processing. The information in the storage module 13 is organized into data structures including several tables, namely, an actor/role table 14, a role/object table 15, a state/action table 16 and a state transition table 17, and an object database 20 containing one or more objects generally identified by reference numeral 21.

The organization of the tables 14 through 17 and object database 20 is described below in connection with Figs. 2A through 3, and the operations performed by processing module 12 is described below in connection with Figs. 4A and 4B. Preliminarily, however, the activity coordination system 10, using the contents of the various tables 14 through 17 and the objects 21 in the object database 20, formalizes and coordinates the actions of a number of actors in connection with a single activity within an organization, such as a business, while the actors may have competing demands on them from a number of activities in the organization. The activity coordination system 10 facilitates coordination of the various constituents of an activity, formalizing negotiations among actors in the various roles, recording pro-

posed and committed terms resulting from the negotiations, permitting scheduling, and so forth, to enable the achievement of the intended result of the activity.

In this operation, the actor/role table 14 identifies roles each actor performs in the activity and the role/object table 15 identifies objects which may be controlled by the roles identified in the actor/role table 14. Each object 21 contains information relating to a constituent of an activity, such as the state of the constituent, as well as negotiations, commitments, and so forth which take place among actors, using the activity coordination system 10, in connection with the constituent. The state/action table 16 determines the actions that the actor may take in connection with the objects based on their states, and the state transition table 17 determines, based on the state of the object and an action selected by the actor, a new state for the object.

A specific example would facilitate an understanding of the utility and operation of the activity coordination system 10. In one specific embodiment, the activity coordination system 10 assists in an activity which includes the design and manufacture of a product, within the context of an organization which may include a plurality of such activities. In such a system, the actors comprise the particular people who are involved in the activity, and the roles may include such actions as Product Manager, Engineer, Finance, Marketing, Manufacturing, and so forth. The actor/role table 14 thus identifies the particular persons who may perform the various roles. In that context, the Product Manager role is associated with the actor responsible for the product. The Engineer role is associated with the actor responsible for providing engineering services in connection with the design of this product as well as other products, if any. The Finance role is associated with the actor who is responsible for providing funding in connection with this product as well as other products, if any. Similarly, the Marketing and Manufacturing roles are associated with the actors who are responsible for providing the respective services in connection with this product as well as other products, if any.

Continuing with the example, the objects 21 identify various constituents required in connection with the activity. The actor performing the Product Manager role may, for example, need to obtain funding for the activity from the actor with the Finance role, and so Funding may comprise a constituent of the activity. The actor performing the Product Manager role may also need to have the actor performing the Engineer role provide engineering services over a time period to provide a product design by a certain date and with a selected cost, which comprises another constituent of the activity. In addition, the actor performing the Product Manager role may also need to have the actors performing the Marketing and Manufacturing roles provide services in connection with such constituents of the activity as the marketing and manufacture of the product, on scheduling and financial arrangements as the various actors may

agree.

Each of the constituent activities is associated with an object 21, which includes information as to the negotiations among actors to determine the various scheduling and financial terms under which the constituent activity will be performed, as well as the state of the constituent. The state may indicate, for example, whether negotiations are proceeding, whether the actors have committed to scheduling, financial and other terms relating to the constituent, whether the constituent has been completed, and so forth. The state further relates to the actions which may be taken in connection with the respective constituents. Thus, for example, if negotiations are proceeding among the various actors with respect to the various constituents of the activity, the states of the objects corresponding to those constituents will reflect a negotiation state. Similarly, if actors have made commitments with respect to various constituents, the states of the corresponding objects will reflect the commitment state. Furthermore, when actors have completed the respective constituents, the states of the corresponding objects will reflect the completion state. Thus, the activity coordination system 10 permits the formalization and coordination of the various constituents of an activity to enable the orderly achievement of the intended result of the activity.

With this background, the structures of the tables 14 through 17 and objects 21 stored in the object database 20 will be described in connection with Figs. 2A through 2D and 3. With reference to Fig. 2A, the actor/role table 14 includes a plurality of entries 30(A) through 30(N) (generally identified by reference numeral 30) each including an actor identification field 31 and a plurality of role flag fields 32(1) through 32(k) (generally identified by reference numeral 32) each defining a flag. Each entry 30 is associated with one actor, who is identified by the contents of the actor field 31, whose actions are to be coordinated by the activity coordination system 10. Similarly, each role flag field 32 in each entry 30 is associated with one role in the activity, that is, the first role flag fields 32(1) in all of the entries 30 are associated with one specific role in the activity, the second role flag fields 32(2) in all of the entries 30 are associated with a second specific role, and so forth. If an actor is associated with, that is, if the actor can perform, one or more roles, the flags of the role flag fields 32 associated therewith have set conditions; alternatively, if an actor cannot perform a specific role in connection with the activity, the flag of the role flag field 32 associated with the activity have cleared conditions.

Similarly, the role/object table 15, which is shown in detail in Fig. 2B, includes a plurality of entries 40(1) through 40(k) (generally identified by reference numeral 40), each including a role identification field 41 and a plurality of object flag fields 42(a) through 42(g) (generally identified by reference numeral 42). Each entry 40 is associated with a role, which is identified by the contents of the role identification field 41, which is, in turn,

associated with the role flag fields 32 in the actor/role table 14. Similarly, each object flag field 42 is associated with one object 21, that is, the first object flag fields 42(a) in all of the entries 40 are associated with one specific object 21, the second object flag fields 42(b) in all of the entries 40 are associated with a second object 21, and so forth. If a role is associated with one or more objects 21, that is, if an actor in a role can access and modify one or more objects 21, the flags of the respective object flag fields 42 have set conditions; alternatively, if a role is not associated with an object 21, such that an actor in a role cannot access and modify the object 21, the flag of the associated object flag field 42 has a cleared condition.

The state/action table 16, which is shown in detail in Fig. 2C, also includes a plurality of entries 50(1) through 50(Z) (generally identified by reference numeral 50), each including a state identification field 51 and a plurality of action flag fields 52(1) through 52(M) (generally identified by reference numeral 52). As noted above, each object 21 can exist in one of a plurality of states, and each entry 50 is associated with a state in which the object 21 can exist. In each entry 50, the state identification field 51 identifies the state associated with the entry, and the action flag fields 52 contain flags that identify the actions that can be taken in connection with the object 21 when the object 21 is in the state associated with the entry 50. Specifically, the sequential action flag fields 52 in the entries 50 are associated with the same actions, that is, action flag fields 52(1) in the entries 50 are all associated with one action, action flag fields 52(11) in all of the entries 50 are all associated with a second action, and so forth. If a particular action can be performed in connection with an object 21 which has a particular state, the flag in the action flag field 52 associated with the action of the entry 50 associated with the state has a set condition; alternatively if an action cannot be performed in connection with the object 21 which has a particular state, the flag in the action flag field 52 associated with the action of the entry 50 associated with the state has a cleared condition.

In addition, the state transition table 17, which is shown in detail in Fig. 2D, has a plurality of entries 60(1) through 60(Z) (generally identified by reference numeral 60), each including a state identification field 61 and a plurality of state transition fields 62(1) through 62(Z). Like the entries 50 in the state/action table 16, each entry 60 in the state transition table 17 is associated with one state in which an object 21 can exist. In each entry 60, the state identification field 61 identifies the state with which the entry 61 is associated. Each of the state transition fields 62 in each entry 60 is also associated with a state, with one state transition field 62 being associated with each state in which the object 21 can exist. Furthermore, the sequential state transition fields 62 in the various entries 60 are associated with the various states, that is, the state transition fields 62(1) in all of the entries 60 are associated with a first state, the state

transition fields 62(2) in all of the entries 60 are associated with a second state, and so forth. The contents of each state transition field 62 in an entry 60 identify an action, which, when performed in connection with an object 21 which is in the state identified in the entry's state identification field 61, will result in the object 21 being in the state associated with the state transition field 62.

It will be appreciated that the activity coordination system 10 may include a plurality of objects 21 which have different sets of states and actions. To accommodate that, the activity coordination system 10 may include a plurality of state/action tables 16, with each state/action table 16 being associated with one of the objects 21 to define the actions which can be performed in connection with the object 21. In that case, each of the state/action tables 16 includes a tag identifying the object 21 associated with the state/action table 16.

In addition, actions performed by the activity coordination system 10 in connection with diverse objects 21 may result in transitions to different states. To accommodate that, the activity coordination system 10 may include a plurality of state transition tables 17, with each state transition table 17 defining the state transitions that can occur in connection with the actions that can be performed in connection with an object. In that case, each of the state transition tables 17 includes a tag identifying the object 21 associated with the state transition table 17.

As noted above, each object 21 stored in the object database 20 contains state and other information relating to a constituent of an activity and is accessed and modified by the processing module 12 in response to information provided by the actor through the actor interface 11 as described below. The structure of an object 21 in the object database 20 is depicted in Fig. 3. With reference to Fig. 3, an object 21 includes three sections, namely, an object identifier section 70, an object role/state section 71 and a constituent information section 72. The object identifier section 70 includes a single field, namely, an object identification field 73.

The object role/state section 71 of object 21 includes four fields, namely, a proposer field 74, a respondent field 75, a turn field 76, which identify the roles in which the various actors can enable the processing module 12 to access the object, and a state field 77 which identifies the state of the object 21. The proposer field 74 and respondent field 75 identify roles, which are associated with the various role flag fields 32 (Fig. 2A) in the actor/role table 14. If either the proposer field 74 or the respondent field 75 identify a role which an actor can perform, as indicated by the actor/role table 14, the actor may enable the processing module 12 to access the object 21.

The turn field 76 of the object role/state section 71 further restricts access to the object 21, in particular to an actor performing either the role identified by the requester field 74 or an actor performing the role identified by the respondent field 75. Specifically, the

contents of the turn field 76 identify either the proposer field 74 or the respondent field 75, and an actor performing the role identified by the contents of the field 74 or 75 identified by the turn field 75 can enable the processing module 12 to access the object 21. When an actor enables the processing module 12 to access the object 21, the processing module 12 modifies the contents of the turn field 76 to identify the other of the proposer field 74 or the respondent field 75 so that access to the object 21 alternates between an actor performing the role identified by the proposer field 74 and an actor performing the role identified by the respondent field 75. The state field 77 contains state information identifying the state of the object 21.

The constituent information section 72 contains information as to the constituent of the activity associated with the object 21. The particular fields which are included in the constituent information section 72 depend upon the particular constituent or activity being coordinated by the activity coordination system 10. In one specific embodiment in which the activity coordination system 10 coordinates the design and manufacture of a product within an organization, the constituent information section includes a proposed terms field 80, a committed terms field 81 and an actuals field 82. The processing module 12 inserts into the proposed terms field 80 information identifying terms under which the actors performing the roles and operating as proposer and respondent as identified in fields 74 and 75, propose to perform the constituent of the activity associated with the object. When the proposer and respondent both agree to the terms in the proposed terms field 80, the processing module 12 inserts the agreed terms in the committed terms field 81. Finally, the actuals field 82 is provided to receive information as to the actual result of the constituent, to facilitate comparisons with the previously-agreed terms in the committed terms field 81.

With this background, the detailed operations of the processing module 12 (Fig. 1) will be described in connection with Figs. 4A and 4B, following which a discussion of the operations of the activity coordination system 10 in connection with a specific example will be presented. With reference to Fig. 4A, when an actor initiates use of the activity coordination system 10, the processing module 12 first obtains from the actor, through the actor interface 11, the identification of the actor and a role (step 100). The processing module 12 then determines from the actor/role table 14 whether the actor may perform the identified role (step 101) by determining whether a flag is set in the role flag field 32 associated with the role in the entry 30 in the actor/role table 14 associated with the actor. If the flag is not set, the actor is not permitted to perform the requested role and so the processing module 12 returns to step 100 to permit the actor may identify another role.

If, in step 101, the processing module 12 determines that the flag is set in the role flag field 32 associated with the role identified by the actor, the processing

module 12 sequences to step 102, in which it obtains, from the actor through the actor interface 11, the identification of an object 21 that the actor wishes the processing module 12 to access. The processing module 12, using the role/object table 15, then determines whether the identified object 21 is associated with the role, that is, whether the actor, performing the role, can enable the processing module 12 to access the object 21 (step 103). In that operation, the processing module 12 determines whether the flag is set in the object flag field 42, associated with the identified object 21, of the entry 40 associated with the role in the role/object table 15 (Fig. 2B). If the flag is not set, the processing module 12 returns to step 102 to obtain the identification of another object 21, or alternatively returns to step 100 if no other object 21 is identified.

If, on the other hand, in step 103 the processing module 12 determines that the flag is set in the object flag field 42 indicating that the actor, performing the role, can enable the processing module 12 to access the object 21, the processing module 12 retrieves the identified object 21 from the object database 20 (step 104) and determines its state (step 105) as indicated by the contents of its state field 77. Using the identified state, the processing module 12 then, using the state/action table 16, identifies the actions that can be performed in connection with the object 21 (step 106). In so doing, the processing module 12 identifies the actions associated with the flags that are set in the action flag fields 52 in the entry 50 associated with the state identified by the contents of the state field 77. It will be appreciated that, if the storage module contains a plurality of state/action tables 16 each associated with one or more selected objects, the processing module 12 will use the state/action table 16 associated with the object 21 in this operation.

The processing module 12 then transmits the identified actions to the actor interface 11 to permit the actor to identify a desired action and provide additional information, if necessary, to permit the object 21 to perform processing of the object 21 as required in connection with the action. After the actor, through the actor interface 11, identifies an action and provides any additional information which may be necessary (step 107), the processing module 12 determines from the state transition table 17 the identification of the new state resulting from performance of the action in connection with the object 21 (step 110). The processing module 12 then performs any necessary processing in connection with the additional information, updating the constituent information section 72 and state field 77 of the object 21 in the object database 20 (step 111).

Following step 111, which is the last step in the processing of the selected object 21, the processing module 12 then inquires of the actor, through the actor interface 11, whether the actor wishes to initiate processing in connection with any other objects 21 (step 112). If so, the processing module 12 returns to step 102

to permit the selection of another object 21. However, if the actor does not wish to initiate processing in connection with any other objects 21, the processing module 12 returns to step 100. At that point, another actor may initiate processing of objects by the processing module 12.

It will be appreciated that the activity coordination system 10 (Fig. 1), through the various objects 21 and the tables 14 through 17, facilitates coordination of the various constituents of an activity, formalizing negotiations among actors in the various roles, recording proposed and committed terms resulting from the negotiations, permitting scheduling, and so forth, to enable the achievement of the intended result of the activity. The various constituents of the activity are identified and formalized by the various objects 21 provided in the activity coordination system 10. Each object 21 identifies the state of a constituent, and provides a mechanism to record the various negotiations and other information in connection with the constituent. The actor/role table 14 and role/object table 15 jointly provide a mechanism for limiting access to the various objects 21, so that only selected actors in selected roles can effect certain constituents. The state/action table 16 and state transition table 17 formalize the progression of the various constituents, by limiting the actions which may be taken in connection with each of the constituents to those set forth in the state transition table 17, with the actions which can be taken at any time being limited to those set forth in the state/action table 16. Thus, the actor/role table 14 and role/object table 15 limit the constituents in which each actor may participate and the state/action table 16 and state transition table 17 limit and formalize the actions which may be taken in connection with each of the objects 21.

The foregoing description has been limited to a specific embodiment of this invention. It will be apparent, however, that variations and modifications may be made to the invention, with the attainment of some or all of the advantages of the invention. Therefore, it is the object of the appended claims to cover all such variations and modifications as come within the true scope of the invention.

## Claims

1. Apparatus for coordinating actions by a plurality of actors in connection with various constituents of an activity, comprising an actor interface means (11) for initiating use of the system by a selected actor, for providing information to the system from the actor, and for providing responses to the actor from the system, and a processing means (12), characterized in that:

A) the apparatus further includes

- 1) an actor/role definition means (14) for storing and defining a plurality of roles that the actor may assume with respect to the constituents;
- 2) a database (20) for storing a plurality of objects (21), each object being associated with a constituent, each object comprising:
- a) identifier means (73) for identifying the object;
  - b) state means (77) for defining a state of the object;
  - c) information means (72) for storing information relating to the associated constituent;
  - d) state/action definition means (74,75) for storing and defining a plurality of actions that the actors may perform in connection with the various states of each object; and
  - e) state transition definition means (76) for storing and defining state transitions for each object in connection with each action defined by the state/action definition means; and
- 3) role/object access definition means (15) for storing and defining the objects which may be accessed by the actor assuming a particular role; and
- B) the processing means, responsive to the information provided by the actor interface means, further provides:
- 1) means for determining, in response to the role/object access definition means, whether the actor assuming a particular role, as defined by the actor/role definition means, may access an object;
  - 2) means for determining, in response to the state/action definition means, whether the actor may perform an action on the object;
  - 3) means for performing the action on the object according to the information provided by the actor interface means, in response to the determination as to whether the actor may access the object and the determination as to whether the action may be performed on the object; and
  - 4) means for modifying the state of the object as defined by the state transition definition means in response to the action performed on the object.
2. A method, performed in a data processing system, for coordinating actions in connection with constituents of an activity by a plurality of actors, characterized in that the method comprises the steps of:
- defining a plurality of actors associated with an activity;
  - defining a plurality of roles the actors may assume with respect to the constituents of the activity;
  - defining a database (20) containing a plurality of objects, each object being associated with a constituent of the activity and each object containing information regarding the associated constituent, wherein the information comprises the results of negotiations among the actors in determining the terms under which the constituent will be performed and information regarding the state of the constituent;
  - obtaining (100) identification information from a selected actor and information regarding a particular role desired by the actor;
  - determining (101), using a role definition table (14) to identify the roles that the actor may assume;
  - determining (102,103), using an object definition table to identify an object that the actor may access in consideration of the particular role the actor has assumed, as identified by the role definition table;
  - retrieving (104) the object from the object database;
  - determining (105), using a state transition table to record the various states of the object;
  - using (106) an action definition table to identify which actions the actor may perform on the object in consideration of the state of the object and the terms under which the constituent will be performed;
  - transmitting to the actor, information regarding which actions the actor may perform on the object;
  - obtaining (107) information from the actor regarding an action to be performed on the object;
  - performing the action on the object, in response to the information obtained from the actor, after determining that the actor may access the object by referring to the object definition table and that the actor may perform the action on the object by referring to the action definition table;
  - updating (111) the state transition table to record changes in the various states of the object following performance of the action; and
  - providing responses to the actor regarding the action performed on the object.

# Patentanspruch

1. Vorrichtung zum Koordinieren von Aktionen von mehreren Akteuren im Zusammenhang mit verschiedenen Konstituenten einer Aktivität, mit einer Akteur-Schnittstelleneinrichtung (11) zum Initiieren der Nutzung des Systems durch einen ausgewählten Akteur, um Informationen an das System vom Akteur und Antworten an den Akteur vom System zu bereitzustellen, und einer Verarbeitungseinrichtung (12),  
dadurch gekennzeichnet, daß:

A) die Vorrichtung ferner enthält:

- 1) eine Akteur/Rollen-Definitionseinrichtung (14) zum Speichern und Definieren mehrerer Rollen, die der Akteur bezüglich der Konstituenten einnehmen kann;
- 2) eine Datenbank (20) zum Speichern mehrerer Objekte (21), wobei jedes Objekt mit einem Konstituenten in Beziehung steht und enthält:
  - a) eine Identifizierungseinrichtung (73) zum Identifizieren des Objekts;
  - b) eine Zustandseinrichtung (77) zum Definieren eines Zustands des Objekts;
  - c) eine Informationseinrichtung (72) zum Speichern von Informationen bezüglich des in Beziehung stehenden Konstituenten;
  - d) eine Zustands/Aktions-Definitionseinrichtung (74, 75) zum Speichern und Definieren mehrerer Aktionen, die die Akteure in Verbindung mit den verschiedenen Zuständen jedes Objekts ausführen können; und
  - e) eine Zustandsübergangs-Definitionseinrichtung (76) zum Speichern und Definieren von Zustandsübergängen für jedes Objekt im Zusammenhang mit jeder Aktion, die durch die Zustands/Aktions-Definitionseinrichtung definiert ist; und
- 3) eine Rollen/Objektzugriff-Definitionseinrichtung (15) zum Speichern und Definieren der Objekte, auf die von dem eine bestimmte Rolle einnehmenden Akteur zugegriffen werden kann; und

B) die Verarbeitungseinrichtung als Antwort auf die von der Akteur-Schnittstelleneinrichtung

zeugten Informationen ferner bereitstellt:

- 1) eine Einrichtung zum Bestimmen, ob der eine bestimmte Rolle einnehmende Akteur, welche durch die Akteur/Rollen-Definitionseinrichtung definiert wird, auf ein Objekt zugreifen kann, als Antwort auf die Rollen/Objektzugriff-Definitionseinrichtung;
  - 2) eine Einrichtung zum Bestimmen, ob der Akteur eine Aktion am Objekt ausführen kann, als Antwort auf die Zustands/Aktions-Definitionseinrichtung;
  - 3) eine Einrichtung zum Ausführen der Aktion am Objekt in Übereinstimmung mit den von der Akteur-Schnittstelleneinrichtung bereitgestellten Informationen als Antwort auf die Bestimmung, ob der Akteur auf das Objekt zugreifen kann, und die Bestimmung, ob die Aktion am Objekt ausgeführt werden kann; und
  - 4) eine Einrichtung zum Modifizieren des Zustands des Objekts, wie in der Zustandsübergangs-Definitionseinrichtung definiert, als Antwort auf die am Objekt ausgeführte Aktion.
2. Verfahren, das in einem Datenverarbeitungssystem ausgeführt wird, zum Koordinieren von Aktionen im Zusammenhang mit Konstituenten einer Aktivität durch mehrere Akteure, dadurch gekennzeichnet, daß das Verfahren die Schritte enthält:
 

Definieren mehrerer Akteure, die mit einer Aktivität in Beziehung stehen;

Definieren mehrerer Rollen, die die Akteure bezüglich der Konstituenten der Aktivität einnehmen können;

Definieren einer Datenbank (20), die mehrere Objekte enthält, wobei jedes Objekt mit einem Konstituenten der Aktivität in Beziehung steht und Informationen bezüglich des in Beziehung stehenden Konstituenten enthält, wobei die Informationen die Ergebnisse von Verhandlungen zwischen den Akteuren bei der Bestimmung der Fristen, innerhalb derer der Konstituent ausgeführt wird, sowie Informationen bezüglich des Zustands des Konstituenten enthalten;

Erhalten (100) von Identifizierungsinformationen von einem ausgewählten Akteur und von Informationen bezüglich einer besonderen Rolle, die vom Akteur gewünscht ist;

Ausführen einer Bestimmung (101) unter Verwendung einer Rollen/Objektzugriff-Definitionseinrichtung (14), um die Rollen zu identifizieren, die der Akteur einnehmen kann;

Ausführen einer Bestimmung (102, 103) unter



Verwendung einer Objektdefinitionstabelle, um ein Objekt zu identifizieren, auf das der Akteur angesichts der besonderen Rolle, die der Akteur eingenommen hat und die durch die Rol-  
 lendefinitionstabelle identifiziert wird, zugreifen kann;  
 Wiederauffinden (104) des Objekts aus der Objekt-Datenbank;  
 Ausführen einer Bestimmung (105) unter Verwendung einer Zustandsübergangstabelle, um die verschiedenen Zustände des Objekts aufzuzeichnen;  
 Verwenden (106) einer Aktionsdefinitionstabelle, um festzustellen, welche Aktionen der Akteur am Objekt angesichts des Zustands des Objekts und der Fristen, innerhalb derer der Konstituent ausgeführt wird, ausführen kann;  
 Senden von Informationen über die Aktionen, die der Akteur am Objekt ausführen kann, zum Akteur;  
 Erhalten (107) von Informationen vom Akteur über eine am Objekt auszuführende Aktion;  
 Ausführen der Aktion am Objekt als Antwort auf die vom Akteur erhaltenen Informationen, nachdem bestimmt worden ist, daß der Akteur auf das Objekt zugreifen kann, indem auf die Objektdefinitionstabelle Bezug genommen wird, und daß der Akteur die Aktion am Objekt ausführen kann, indem auf die Aktionsdefinitionstabelle Bezug genommen wird;  
 Aktualisieren (111) der Zustandsübergangstabelle, um Änderungen in den verschiedenen Zuständen des Objekts, die der Ausführung der Aktion folgen, aufzuzeichnen; und  
 Erzeugen von Antworten an den Akteur bezüglich der am Objekt ausgeführten Aktion.

## Revendications

1. Appareil pour coordonner des actions exécutées par une multiplicité d'acteurs relativement à divers constituants d'une activité, comportant un moyen formant interface d'acteur (11) pour déclencher l'utilisation du système par un acteur sélectionné, pour fournir des informations de l'acteur au système, et pour fournir des réponses du système à l'acteur depuis le système, et un moyen de traitement (12), caractérisé en ce que:

A) l'appareil comporte, en outre:

- 1) un moyen de définition acteur/rôles (14) pour emmagasiner et définir une multiplicité de rôles que l'acteur peut assumer relativement aux constituants;
- 2) une base de données (20) pour emmagasiner une multiplicité d'objets (21), cha-

que objet étant associé à un constituant, chaque objet comportant:

- a) des moyens d'identification (73) pour identifier l'objet;
- b) des moyens de définition d'état (77) pour définir un état de l'objet;
- c) des moyens de stockage d'informations (72) pour emmagasiner des informations relatives au constituant associé;
- d) des moyens de définition état/action (74, 75) pour emmagasiner et définir une multiplicité d'actions que les acteurs peuvent effectuer relativement aux divers états de chaque objet; et
- e) des moyens de définition de transition d'état (76) pour emmagasiner et définir des transitions d'état pour chaque objet relativement à chaque action définie par les moyens de définition état/action; et

- 3) des moyens de définition d'accès rôle/objet (15) pour emmagasiner et définir les objets auxquels peut accéder l'acteur qui assume un rôle particulier; et

B) le moyen de traitement, réagissant aux informations fournies par le moyen formant interface d'acteur, prévoit, en outre:

- 1) des moyens pour déterminer, en réponse aux moyens de définition d'accès rôle/objet, si l'acteur assumant un rôle particulier, tel que défini par le moyen de définition acteur/rôles, peut accéder à un objet;
- 2) des moyens pour déterminer, en réponse aux moyens de définition état/action, si l'acteur peut exécuter une action sur l'objet;
- 3) des moyens pour exécuter l'action sur l'objet selon les informations fournies par le moyen formant interface d'acteur, en réponse à la détermination de la possibilité pour l'acteur d'accéder à l'objet et à la détermination de la possibilité d'exécuter l'action sur l'objet; et
- 4) des moyens pour modifier l'état de l'objet tel que défini par les moyens de définition de transitions d'état en réponse à l'action exécutée sur l'objet.

2. Procédé, exécuté dans un système de traitement de données, pour coordonner des actions exécutées relativement à des constituants d'une activité par une multiplicité d'acteurs, caractérisé en ce que le procédé comporte les étapes consistant:

à définir une multiplicité d'acteurs associés à une activité;

à définir une multiplicité de rôles que les acteurs peuvent assumer relativement aux constituants de l'activité; 5

à définir une base de données (20) contenant une multiplicité d'objets, chaque objet étant associé à un constituant de l'activité et chaque objet contenant des informations concernant le constituant associé, les informations comportant les résultats de négociations parmi les acteurs pour déterminer les termes selon lesquels le constituant sera exécuté et des informations concernant l'état du constituant; 10

à obtenir (100) des informations d'identification d'un acteur sélectionné et des informations concernant un rôle particulier souhaité par l'acteur; 15

à déterminer (101), en utilisant une table de définitions de rôles (14) pour identifier les rôles que l'acteur peut assumer; 20

à déterminer (102, 103), en utilisant une table de définitions d'objets pour identifier un objet auquel l'acteur peut accéder en considération du rôle particulier que l'acteur a assumé, tel qu'identifié par la table de définitions de rôles; 25

à extraire (104) l'objet de la base de données d'objets;

à déterminer (105), en utilisant une table de transitions d'état pour enregistrer les divers états de l'objet; 30

à utiliser (106) une table de définitions d'actions pour identifier les actions que l'acteur peut exécuter sur l'objet en considération de l'état de l'objet et des termes selon lesquels le constituant sera exécuté; 35

à transmettre à l'acteur des informations concernant les actions que l'acteur pourra exécuter sur l'objet;

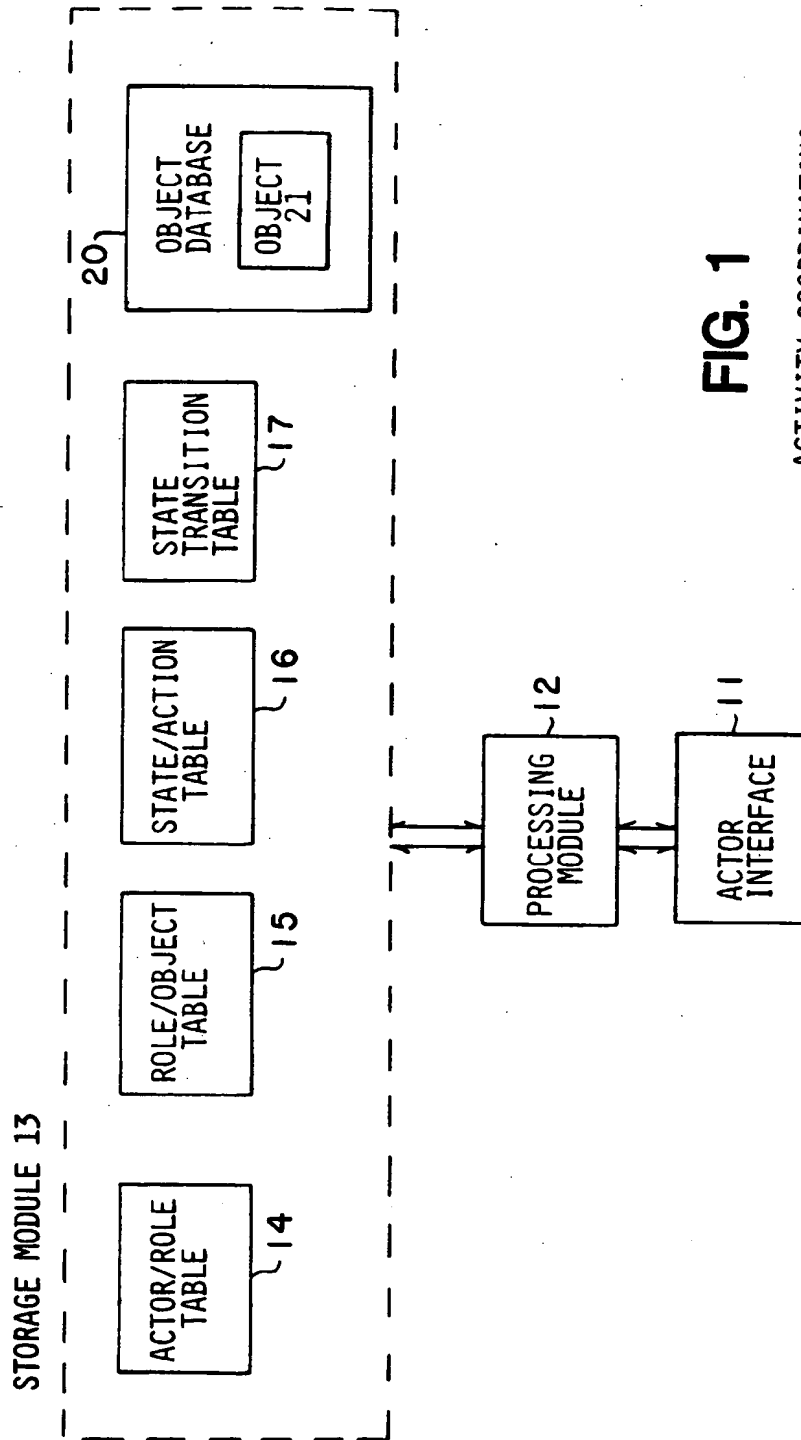
à obtenir (107) de l'acteur des informations concernant une action à exécuter sur l'objet; 40

à exécuter l'action sur l'objet, en réponse aux informations obtenues de l'acteur, après avoir déterminé la possibilité pour l'acteur d'accéder à l'objet en se référant à la table de définitions d'objets, ainsi que la possibilité pour l'acteur d'exécuter l'action sur l'objet en se référant à la table de définitions d'actions; 45

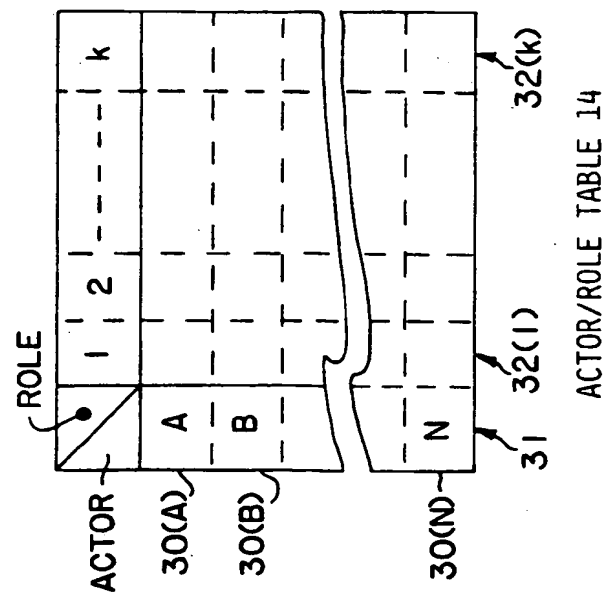
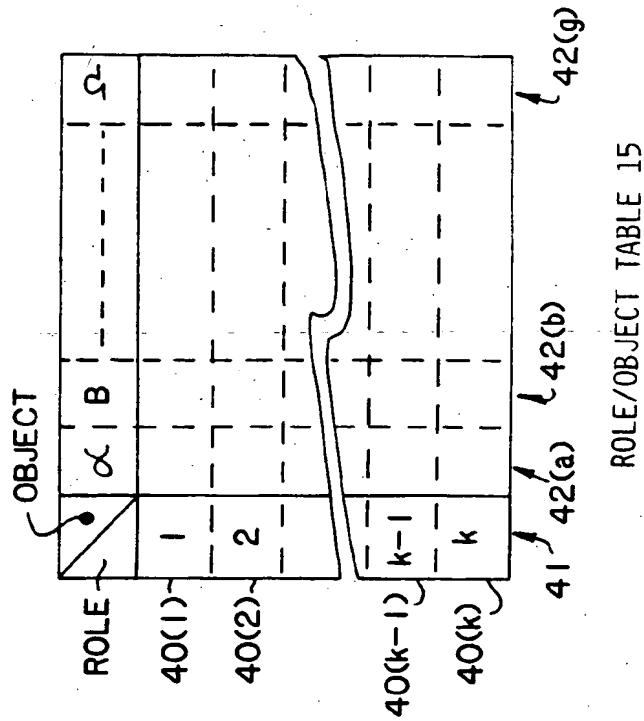
à mettre à jour (111) la table de transitions d'état pour enregistrer des modifications des divers états de l'objet suite à l'exécution de l'action; et 50

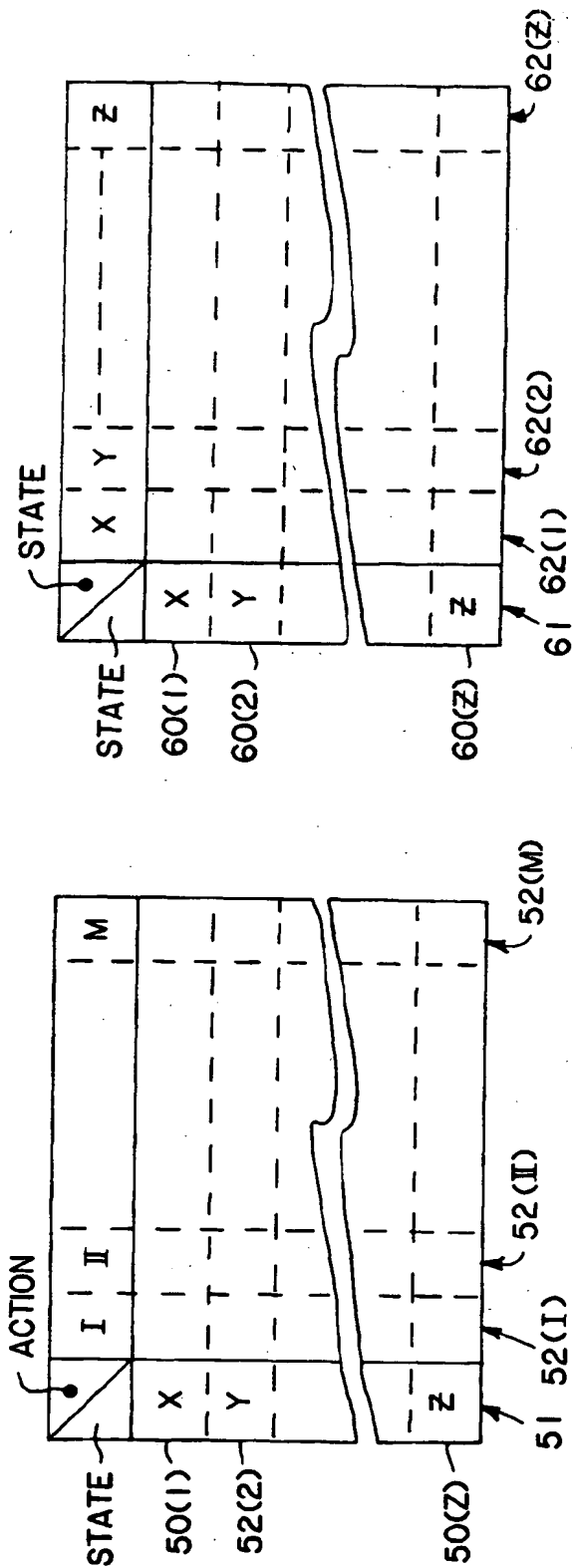
à fournir des réponses à l'acteur relativement à l'action exécutée sur l'objet.

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**FIG. 1**  
ACTIVITY COORDINATING  
SYSTEM 10





STATE TRANSITION TABLE 17

FIG. 2D

STATE/ACTION TABLE 16

FIG. 2C

**FIG. 3**

STRUCTURE OF OBJECT 21

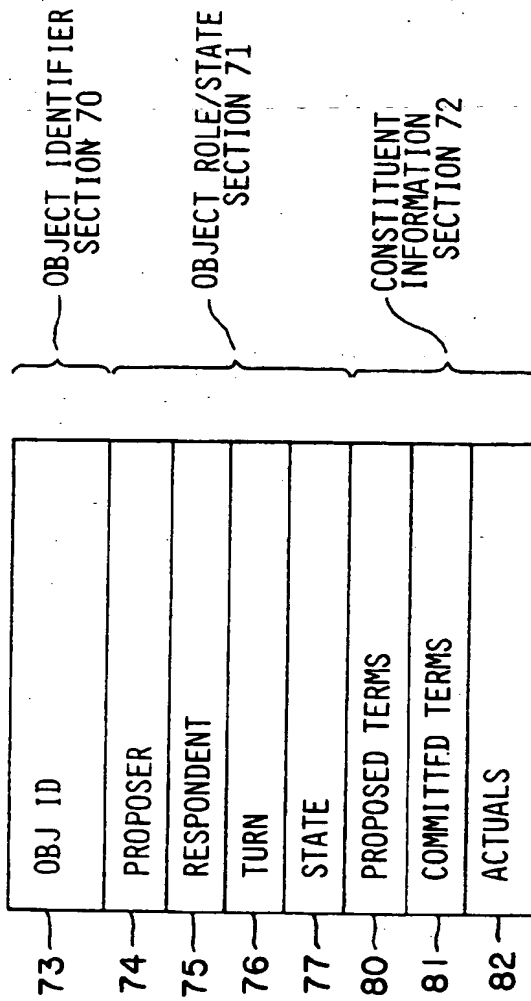


FIG. 4A

FIG. 4B

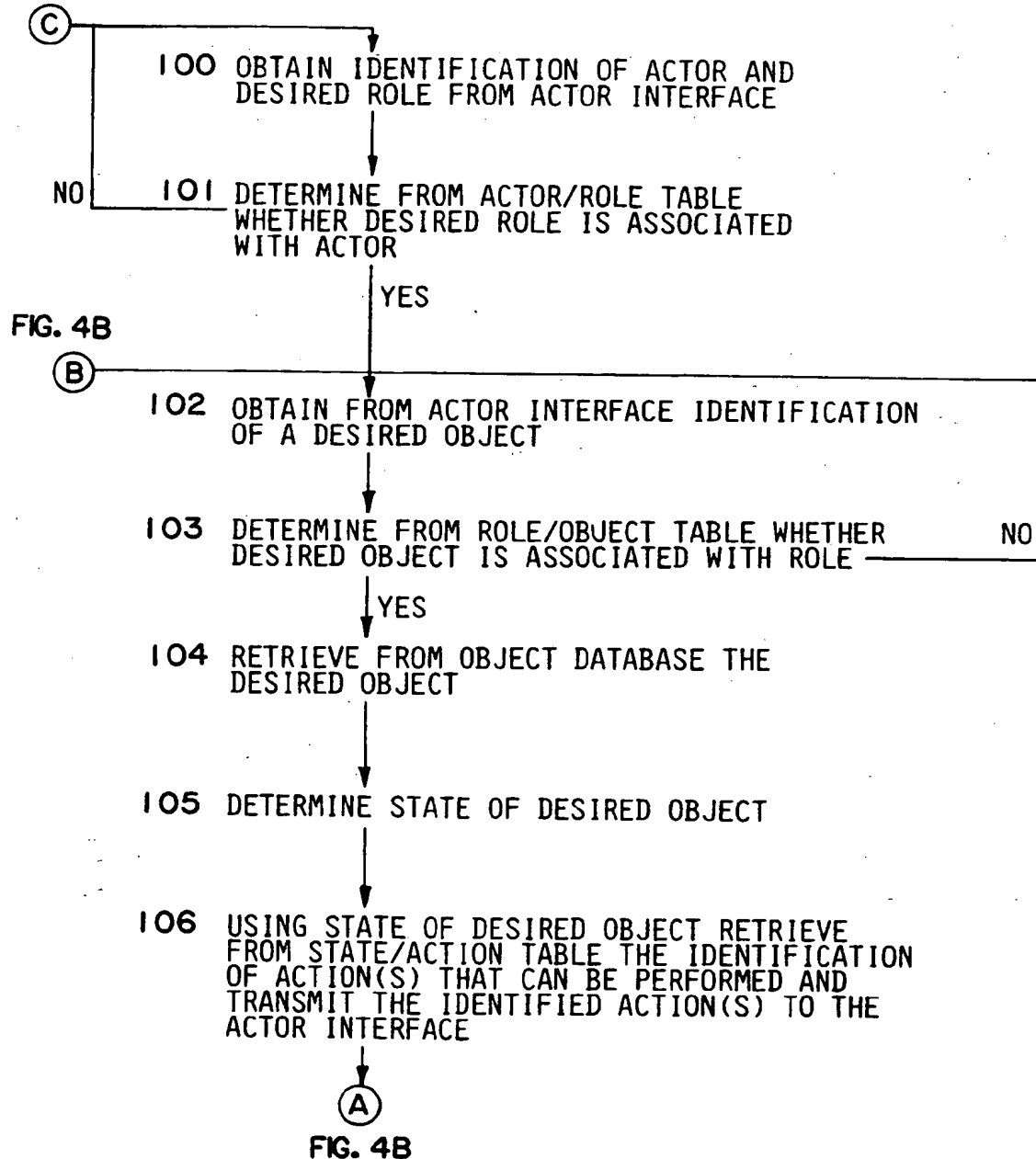


FIG. 4B

